

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

The Palomar Energy Project consists of a proposed natural gas-fired combined cycle power plant and associated reclaimed water supply and brine return pipelines. The project will have a nominal electrical output of 500 MW, and commercial operation is planned for the summer of 2004. The project will be fueled with natural gas delivered via the San Diego Gas and Electric Company (SDG&E) gas system, and an existing SDG&E natural gas pipeline with sufficient capacity to serve the project is located immediately adjacent to the project site. The project includes a new 230 kV switchyard connecting with an existing SDG&E electric transmission line also located immediately adjacent to the project site. Reclaimed water for the project will be supplied from the City of Escondido's Hale Avenue Resource Recovery Facility (HARRF) via a new 1.1 mile, 16-inch supply pipeline extending from an existing reclaimed water main. Brine from the project will be returned to the HARRF via a new 1.1 mile, 8-inch return pipeline routed alongside the reclaimed water supply pipeline and connecting to an existing brine return line.

The project owner and Applicant submitting this Application for Certification (AFC) is Palomar Energy, LLC, a Delaware limited liability company, the sole member of which is a subsidiary of Sempra Energy Resources (SER). The Palomar Energy Project is among those resources that have been identified as potential suppliers of electricity under a contract between Sempra Energy Resources and the California Department of Water Resources for the sale of 1900 MW.

2.2 LOCATION OF FACILITIES

The power plant is proposed to be located on a vacant 20-acre site within a planned 186-acre industrial park in the City of Escondido, California. Figure 2.2-1 illustrates the location of the project site, the route of the reclaimed water supply and brine return pipelines, and the location of a minor SDG&E gas system upgrade associated with the project. Development of the industrial park will result in eight Planning Areas, each comprising a graded pad as illustrated in Figure 2.2-2. The 20-acre project site subsumes a 14.1-acre pad designated as Planning Area 1.

The project site is located west of Interstate 15 and south of State Highway 78, about 600 feet southwest of the intersection of Vineyard Avenue and Enterprise Street. Access to the site is provided from State Highway 78 by traveling south on Nordahl Road, which becomes Vineyard Avenue. Figure 2.2-1 illustrates nearby roads in relation to the site.

The legal description of the project site is as follows: a portion of the northwest quarter of Section 20, Township 12 South, Range 2 West, San Diego County. The site consists of majority portions of the current Assessor Parcel Numbers 232-051-02 and 232-051-03. A new parcel that corresponds with the 20-acre project site is being created along with all of the other new parcels within the industrial park.

Figure 2.2-1 Location of Project Facilities

Figure 2.2-2 Planned 186-Acre Industrial Park

2.3 SITE DESCRIPTION

The site proposed as the location for the power plant is 20-acre area that subsumes a 14.1-acre pad designated as Planning Area 1, one of eight Planning Areas within the planned 186-acre industrial park illustrated in Figure 2.2-2. The 20-acre project site is presently vacant, and photographs of the site in its current condition are presented in Figure 2.3-1.

The project site in its current condition consists of three contiguous areas: a central graded area at an existing elevation of about 790 feet above mean sea level (amsl), a largely cleared slope that was formerly an avocado and citrus grove to the north of the graded area, and naturally vegetated slopes to the south of the graded area. Existing site elevations range from approximately 740 to 826 feet amsl, and a large majority of the site lies between 750 and 790 feet amsl. The site is bounded on the north by a vacant lot planned as the location for a 49 MW gas-fired combustion turbine plant, on the east by existing industrial land uses, on the south by future industrial land uses within the planned industrial park, and on the west by an existing SDG&E transmission corridor and future industrial land uses within the planned industrial park. The SDG&E transmission corridor includes a total of 8 existing circuits with voltages of 230 kV, 138 kV, and 69 kV. An existing wooden pole line comprising one 69 kV circuit and underbuilt 12 kV distribution circuits presently crosses the project site and will be relocated.

Mass grading of the 186-acre industrial park will result in a graded pad comprising each Planning Area, including the 14.1-acre Planning Area 1 proposed for use as the power plant site, as illustrated in Figure 2.2-2. The cut and fill grading necessary to create the pad for Planning Area 1 will result in an elevation of approximately 750 feet amsl, and the net excavated materials from Planning Area 1 will be used as fill in other portions of the industrial park. Grading of the overall industrial park, including Planning Area 1, will be completed prior to initiation of any on-site work on the Palomar Energy Project. Should the power plant not be constructed, Planning Area 1 will be used for alternative industrial land uses consistent with the development standards for the industrial park.

Figure 2.3-1 Photographs of the Project Site

2.4 POWER PLANT DESCRIPTION

The following sections describe the project site arrangement and the processes, systems, and equipment that constitute the proposed power plant. All project facilities will be designed, constructed, and operated in accordance with applicable laws, ordinances, regulations, and standards.

2.4.1 Site Arrangement

The project site arrangement and an elevation view of the power plant are provided in Figures 2.4-1 and 2.4-2, respectively.

Major components comprising the power plant include two combustion turbine-generators and one steam turbine-generator, two heat recovery steam generators, one plume-abated wet cooling tower, an operations building that incorporates control, maintenance, and administrative functions, and a 230 kV switchyard. The switchyard will be connected to an existing 230 kV transmission line which runs along the western boundary of the project site, and no new transmission lines will be required.

Primary access to the site is provided by a new 30 foot wide, 200 foot long paved road extending across the SDG&E transmission corridor from the future Citracado Parkway to the south end of the site. Secondary access to the site is provided by a new 20 foot wide, 200 foot long paved road extending across the SDG&E transmission corridor from the future Citracado Parkway to the north end of the site. The site access roads are illustrated in Figure 2.2-2. A 20 foot wide, paved loop road provides access to the power plant facilities, as illustrated in Figure 2.4-1.

2.4.2 Process Description

This section describes the power generation process and thermodynamic cycle employed by the proposed project.

The power plant consists of two combustion turbine-generators (CTGs) equipped with dry low NO_x combustors and evaporative inlet air coolers, two heat recovery steam generators (HRSGs) equipped with duct burners, a steam turbine-generator (STG), and associated auxiliary systems and equipment. The CTGs and duct burners are fueled exclusively with natural gas. The duct burners enable the HRSGs to produce extra steam in order to obtain peaking output from the STG. This design feature enhances the power plant's ability to respond to the energy and ancillary services markets.

At full load, each CTG generates approximately 165 MW at average ambient conditions. Heat from the CTG exhausts is used in the HRSGs to generate steam and to reheat steam. With the CTGs at full load and the duct burners out-of-service, the HRSGs produce sufficient steam for operation of the STG at its base load output of 187 MW at average ambient conditions, which results in an overall plant gross output of approximately 517 MW. With the CTGs at full load and the duct burners in-service, the HRSGs produce sufficient steam for operation of the STG at

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its peaking output of 229 MW at average ambient conditions, which results in an overall plant gross output of approximately 560 MW.

Overall annual availability of the power plant is expected to be in the range of 92 to 96 percent. The plant's capacity factor will depend on the provisions of bilateral power sales contracts as well as market prices for electricity, ancillary services, and natural gas. The design of the power plant provides for operating flexibility (i.e., ability to start up, shut down, turn down, and provide peaking output) so that operations may be readily adapted to changing market conditions.

A heat balance diagram corresponding to base load operation of the power plant is shown in Figure 2.4-3. This base load heat balance is based on average ambient conditions of 62°F and 72% relative humidity, evaporative coolers in-service, and duct burners out-of-service. A heat balance diagram corresponding to peak load operation of the power plant is shown in Figure 2.4-4. This peak load heat balance is based on the same average ambient conditions, evaporative coolers in-service, and duct burners in-service providing the STG with extra steam for peaking output.

The following provides a brief description of the power plant's thermodynamic cycle:

Air flows through the inlet air filter, evaporative cooler, and associated inlet air ductwork of each CTG and is then compressed in the CTG compressor. Compressed air exiting the compressor flows to the CTG combustors. Natural gas fuel is then injected into the combustors and ignited. The hot combustion gases expand through the CTG turbine to drive the entire CTG, including the compressor and the electric generator which share a common shaft with the turbine. The hot combustion gases exit the turbine and enter an HRSG dedicated to each CTG. Duct burners installed in each HRSG further heat the CTG exhausts at times when peaking output is desired.

In the HRSGs, heat from the CTG exhausts is transferred to water pumped into the HRSG pressure parts (economizers, evaporators, drums, etc.). The water is converted to superheated steam and is delivered to the STG at three pressures, high pressure (HP), intermediate pressure (IP), and low pressure (LP). The use of multiple steam delivery pressures provides an increase in cycle efficiency. HP steam from the HRSG is admitted to the HP section of the STG, expands through the HP section to drive the STG, and exits the HP section as "cold reheat" steam. The cold reheat steam is combined with IP steam from the HRSG and delivered to the HRSG reheater. "Hot reheat" steam leaving the reheater is admitted to the IP section of the STG and expands through the IP and LP sections to further drive the STG. LP steam from the HRSG is admitted to the LP section of the STG and expands through the LP section to still further drive the STG.

Steam leaving the LP section of the STG enters a surface condenser, gives up its latent heat to circulating water, and is condensed to liquid. The circulating water flows through a plume-abated wet cooling tower where the heat is rejected to the atmosphere, and the circulating water is then pumped back to the surface condenser.

Figure 2.4-1 Site Arrangement

Figure 2.4-2 Elevation View

Figure 2.4-3 Heat Balance at Base Load

Figure 2.4-4 Heat Balance at Peak Load

2.4.3 CTGs, HRSGs, and STG

This section describes the major energy conversion components of the proposed project including the CTGs, HRSGs, and STG.

2.4.3.1 Combustion Turbine-Generators

Thermal energy is produced in each of the two CTGs through the combustion of natural gas, and it is converted into mechanical energy by the CTG turbine that drives the CTG compressor and electric generator. The CTGs employ “F” technology and are supplied by GE Power Systems.

Each CTG consists of a heavy duty, single shaft, combustion turbine-generator and associated auxiliary equipment. The CTGs are equipped with dry low NO_x combustors designed for natural gas. Procurement of the CTGs is conducted in accordance with functional performance criteria, including the following:

- Air emissions at the gas turbine exhaust shall not exceed specified levels.
- Noise emissions shall not exceed specified near-field and property line levels.
- Each CTG shall be capable of operation at 50% to 100% load while meeting specified air emissions performance criteria.
- Each CTG shall be capable of a specified number of startups per year.

The CTGs are equipped with accessories required to provide efficient, safe, and reliable operation, including the following:

- Inlet air filters and on-line filter cleaning system.
- Evaporative inlet air coolers.
- On-line and off-line compressor wash system.
- Fire detection and protection system.
- Lubrication oil system including oil coolers and filters.
- Generator coolers.
- Starting system, auxiliary power system, and control system.
- Metal acoustical enclosures designed for outdoor service.

2.4.3.2 Heat Recovery Steam Generators

The HRSGs generate steam by transferring heat from the CTG exhausts to condensate and feedwater. Each of the two HRSGs is a multi-pressure, natural circulation boiler equipped with a transition duct connecting to the CTG exhaust, duct burners, outlet duct, and exhaust stack. Each of the two exhaust stacks is 17 feet in diameter and 110 feet tall.

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The HRSG pressure parts contain water and/or steam and include economizers, evaporators, drums, superheaters, and reheater for the LP, IP, and HP portions of the HRSG, as applicable.

Condensate from the condenser is delivered by condensate pumps to the LP portion of the HRSG. This condensate flows through the LP economizer and on to the LP drum. By natural circulation, water from the LP drum flows through downcomers to the inlet headers of the LP evaporator, upward through the LP evaporator where the water is partially converted to steam, and back to the LP drum. The saturated steam and water are separated in the LP drum, and the steam is delivered to the LP superheater inlet. The superheated steam leaving the LP superheater is delivered to the LP admission of the STG.

Water from the LP drum flows to boiler feed pumps, which provide the pressure required to serve the IP and HP sections of the HRSG.

Feedwater discharged from the boiler feed pumps at intermediate pressure is delivered to the IP portion of the HRSG. This feedwater flows through the IP economizer and on to the IP drum. By natural circulation, water from the IP drum flows through downcomers to the inlet headers of the IP evaporator, upward through the IP evaporator where the water is partially converted to steam, and back to the IP drum. The saturated steam and water are separated in the IP drum, and the steam is combined with cold reheat steam from the STG and delivered to the reheater inlet. The superheated steam leaving the reheater is delivered to the IP admission of the STG.

Feedwater discharged from the boiler feed pumps at high pressure is delivered to the HP portion of the HRSG. This feedwater flows through the HP economizer and on to the HP drum. By natural circulation, water from the HP drum flows through downcomers to the inlet headers of the HP evaporator, upward through the HP evaporator where the water is partially converted to steam, and back to the HP drum. The saturated steam and water are separated in the HP drum, and the steam is delivered to the HP superheater inlet. The superheated steam leaving the HP superheater is delivered to the HP admission of the STG.

Duct burners are installed in each HRSG. Through the combustion of natural gas, the duct burners heat the CTG exhausts at times when peaking output is desired. The duct burners may also be used as needed to control the temperature of steam produced by the HRSGs.

Each HRSG is equipped with a selective catalytic reduction (SCR) system that uses aqueous ammonia (less than 20% ammonia, and the balance water) in conjunction with a catalyst bed to reduce nitrogen oxides (NO_x) in the CTG exhausts. Aqueous ammonia is injected upstream of the catalyst bed located within each HRSG. The subsequent catalytic reaction converts NO_x to nitrogen and water, resulting in a reduced concentration of NO_x in the exhaust exiting the stack.

An oxidation catalyst located within each HRSG reduces the concentration of carbon monoxide and volatile organic compounds in the exhaust exiting the stack.

2.4.3.3 Steam Turbine-Generator

Steam from the HRSGs is admitted to the STG as described previously. The steam expands through the turbine blading to drive the steam turbine, which in turn drives the generator. The STG is of the reheat type and is equipped with accessories required to provide efficient, safe, and reliable operation, including the following:

- Governor system.
- Steam admission system.
- Gland seal system.
- Lubrication oil system including oil coolers and filters.
- Generator coolers.
- Metal acoustical enclosures designed for outdoor service.

2.4.4 Major Electrical Systems and Equipment

This section describes the major electrical systems and equipment of the proposed project. Almost all of the power produced by the power plant will be delivered to the plant's interconnection with SDG&E. A small amount, however, will be used on-site for plant auxiliaries such as pumps, control systems, and general facility loads including lighting and heating, ventilation, and air conditioning (HVAC). Some will be converted from alternating current (AC) to direct current (DC) for control systems and emergency backup systems. The descriptions of the major electrical systems and equipment provided in the following subsections reflect AC power unless otherwise noted. An overall one-line diagram of the major electrical systems is presented in Figure 2.4-5.

2.4.4.1 Step-Up Transformers and Plant Switchyard

Power is generated at 18 kV by the two CTGs and STG, and then is stepped up to 230 kV for delivery to the power plant's interconnection with SDG&E. Each of the plant's three generators is connected by 18 kV bus to a 18/230 kV oil-filled, step-up transformer dedicated to the generator. Each step-up transformer rests on a concrete pad designed to contain the transformer oil in the event of a leak or spill.

The 230 kV side of each step-up transformer is connected by underground conductor to a 230 kV ring bus switchyard at the plant site. The plant switchyard is directly connected with the SDG&E transmission system via a loop-in of the existing 230 kV Escondido-Sycamore Canyon transmission line which runs along the western boundary of the project site. The project does not require the construction of any new transmission lines.

2.4.4.2 Electrical System for Plant Auxiliaries

Power for plant auxiliaries is supplied at 4160 V from two auxiliary transformers. The 18 kV bus of each CTG is provided with a tap connection to an 18 kV/4160 V oil-filled, step-down,

Figure 2.4-5 Electrical One-Line Diagram

auxiliary transformer, and the 4160 V side of each transformer is connected to 4160 V switchgear. Each CTG is provided with an 18 kV generator breaker located between the generator and the tap connection. This configuration allows power for plant auxiliaries to be supplied from the plant switchyard regardless of whether the CTGs and STG are on-line or off-line. The auxiliary transformers rest on concrete pads designed to contain the transformer oil in the event of a leak or spill.

The 4160 V switchgear distributes power to the plant's 4160 V motors, to the CTG starting system, and to 4160/480 V transformers. The low voltage side of the 4160/480 V transformers is connected to 480 V switchgear. The 480 V switchgear distributes power to the plant's large 480 V loads and to 480 V motor control centers (MCCs). The MCCs distribute power to the plant's intermediate 480 V loads and to power panels serving small 480 V loads.

The MCCs also distribute power to 480/277 V isolation transformers serving 277 V single-phase loads and to 480/208/120 transformers serving 208 V and 120 V loads.

2.4.4.3 DC Power Supply System

The plant's DC power supply system consists of a bank of 125 V DC batteries, a 125 V DC battery charger, metering, ground detectors, and distribution panels. In addition, a similar DC power supply system is provided as part of each CTG's auxiliary power system.

Under normal operating conditions, the battery charger supplies DC power to the DC loads. The battery charger receives 480 V, three-phase AC power from the electrical system serving plant auxiliaries. The battery charger continuously charges the battery bank while supplying DC power to the DC loads. Under abnormal or emergency conditions when AC power is not available, the battery bank supplies DC power to the DC loads. The battery bank is sized to power the DC loads for a sufficient amount of time to provide for safe and damage-free shut down of the power plant. Recharging of the battery bank occurs whenever AC power becomes available.

The DC power supply system provides power for critical control circuits, power for control of the 4160 V and 480 V switchgear, and power for DC emergency backup systems. Emergency backup systems include DC lighting and DC lube oil and seal oil pumps for the CTGs and STG.

2.4.4.4 Essential Service AC System

An essential service AC system (120 V, single-phase) provides power to essential instrumentation, critical equipment loads, safety systems, and equipment protection systems that require uninterruptible AC power. The essential service AC system and the DC power supply system are both designed to ensure that critical safety and equipment protection control circuits are always energized and able to function in the event of unit trip or loss of AC power.

The essential service AC system consists of an inverter, a solid-state transfer switch, a manual bypass switch, an alternate AC source transformer and voltage regulator, and AC panel boards.

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The DC power supply system is the normal source of power to the essential service AC system. Power flows from the DC power supply system through the inverter to the AC panel boards. The solid-state transfer switch continuously monitors both the inverter output and the alternate AC source. Upon loss of the inverter output and without interruption of power, the transfer switch automatically transfers essential service AC loads from the inverter output to the alternate AC source. The manual bypass switch enables isolation of the inverter and transfer switch for testing and maintenance without interruption of power to the essential service AC loads.

2.4.5 Fuel Supply and Use

This section describes the quantity of fuel required by the proposed project and the source and quality of the fuel.

The CTGs and duct burners are designed to burn natural gas. The fuel requirement for base load operation at average ambient conditions is approximately 3,444 million Btu per hour. The fuel requirement for peaking operation at average ambient conditions is approximately 3,803 million Btu per hour. Based on 8 hours of base load operation and 16 hours of peak load operation, the total fuel requirement is approximately 88,400 million Btu per day.

The project will be fueled with natural gas delivered via the SDG&E gas system. An existing 16-inch SDG&E natural gas pipeline with sufficient capacity to serve the project is located immediately adjacent to the northeast corner of the project site at the end of Enterprise Street. In order to relieve a bottleneck in a segment of the existing SDG&E gas system located about 1 mile northeast of the project site, SDG&E will construct an upgrade consisting of approximately 2600 feet of 16-inch pipeline. The location of the SDG&E gas system upgrade is illustrated in Figure 2.2-1.

A typical analysis of natural gas delivered to the SDG&E gas system is presented in Table 2.4-1.

The expected minimum pressure of natural gas delivered to the power plant is 350 pounds per square inch, gauge (psig). The natural gas flows through a pressure regulation station, a revenue-quality flow meter, filtering equipment, and two electric motor-driven compressors (when needed) prior to entering the CTG systems. When the SDG&E delivery pressure drops to less than 500 psig, the compressors will operate to maintain an outlet pressure of 500 to 550 psig. Natural gas for the duct burner systems branches off upstream of the compressors and is regulated to a lower pressure. Safety pressure relief valves are provided downstream of pressure regulation valves and downstream of the compressors. The CTG systems include a natural gas preheater, and both the CTG and duct burner systems include flow modulation equipment.

Table 2.4-1 – Typical Analysis of Natural Gas

Constituent	Percent by Volume
Methane	93.50
Ethane	3.00
Propane	0.50
n-Butane	0.10
i-Butane	0.10
n-Pentane	0.03
i-Pentane	0.03
Hexane+	0.04
Carbon dioxide	0.60
Nitrogen	2.10
TOTAL	100.00
Sulfur (grains per 100 scf)	0.75
Higher Heating Value (Btu per scf)	1030

Btu = British thermal units.
scf = standard cubic feet.

2.4.6 Water Supply and Use

This section describes the quantity of water required by the proposed project, the sources and quality of the water supply, and the water treatment requirements of the project. The power plant's various water uses include makeup for the circulating water system, makeup for the HRSGs, makeup for the CTG evaporative coolers, service water, potable water, and fire protection water. A water balance diagram corresponding to base load operation of the power plant at the average ambient conditions of 62°F and 72% relative humidity is presented in Figure 2.4-6. A similar diagram corresponding to peak load operation is presented in Figure 2.4-7.

2.4.6.1 Water Requirements

The base load and peak load water balance diagrams presented in Figures 2.4-6 and 2.4-7 provide estimated flow rates in gallons per minute. Based on 8 hours of base load operation and 16 hours of peak load operation, the daily requirements for the power plant's various water uses are presented in Table 2.4-2. The average annual requirements are also presented in Table 2.4-2, based on 16 hours of peak load operation per day during four months of the year (June through September) and base load operation during all other hours excepting a 14-day maintenance outage.

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Table 2.4-2 – Daily and Annual Water Requirements

Water Use	Daily Requirements (gallons)	Annual Requirements (acre-feet)
Circulating Water System Makeup	3,498,700	3,516
Demineralizer Supply for Producing HRSG Makeup	41,100	41
CTG Evaporative Cooler Makeup	45,800	49
Service Water	14,400	16
Potable Water	1,400	2
TOTAL	3,601,400	3,624

2.4.6.2 Water Source and Quality

Reclaimed water for the project will be supplied from the City of Escondido's Hale Avenue Resource Recovery Facility (HARRF) via a new 1.1 mile, 16-inch supply pipeline extending from an existing reclaimed water main. The route of the reclaimed water supply pipeline is illustrated in Figure 2.2-1. The small quantity of potable water required by the project will be provided by Rincon del Diablo Municipal Water District.

At the power plant, a raw water storage tank with a capacity of 730,000 gallons will hold 530,000 gallons of reclaimed water for plant operation. This quantity is sufficient to cover a 4-hour interruption of water supplied to the power plant. In addition, the raw water storage tank will hold 200,000 gallons of reclaimed water dedicated to the plant's fire protection water system. The quality of reclaimed water supplied from the HARRF is presented in Table 2.4-3.

Table 2.4-3 – Quality of Reclaimed Water Supplied from the HARRF

Water Quality Parameter	Average Concentration
Calcium	229 mg/l
Magnesium	118 mg/l
Sodium	384 mg/l
Potassium	21 mg/l
Total Alkalinity	246 mg/l
Sulfate	254 mg/l
Chloride	326 mg/l
Nitrate	2 mg/l
Carbon Dioxide	0 mg/l
Silica	5 mg/l
Total Dissolved Solids	973 mg/l

Concentrations stated in ppm as CaCO₃, except CO₂ and SiO₂ stated in ppm as such.

Source: City of Escondido, 2001.

Figure 2.4-6 Water Balance at Base Load

Figure 2.4-7 Water Balance at Peak Load

2.4.6.3 Water Treatment

The base load and peak load water balance diagrams presented in Figures 2.4-6 and 2.4-7 show the power plant's various water uses and water treatment processes. The circulating water, HRSG makeup, and CTG evaporative cooler makeup all require treatment at the plant, and this treatment varies according to the quality required for each of these uses. The service water, potable water, and fire protection water do not require treatment at the plant.

The following describes the plant's water treatment processes:

Circulating Water

Makeup water for the circulating water system is supplied from the raw water storage tank. Water conditioning chemicals may be fed into the makeup water to minimize corrosion and to inhibit mineral scale formation and biofouling.

Sulfuric acid is fed into the circulating water system for alkalinity reduction in order to control the mineral scaling tendency of the circulating water. The sulfuric acid is fed in an amount proportional to the circulating water makeup flow. The sulfuric acid feed equipment includes a bulk storage tank and two full-capacity metering pumps.

To further inhibit mineral scale formation, an organic phosphate inhibitor solution may be fed into the circulating water system in an amount proportional to the circulating water blowdown flow. The inhibitor solution feed equipment includes a bulk storage tank and two full-capacity metering pumps.

To inhibit biofouling, sodium hypochlorite is shock-fed into the circulating water system as a biocide. The sodium hypochlorite feed equipment includes a bulk storage tank and two full-capacity metering pumps.

HRSG Makeup

Makeup water for the HRSGs must meet stringent specifications for suspended and dissolved solids. To meet these specifications, water supplied from the raw water storage tank is first filtered and then demineralized. Demineralization is accomplished using ion exchange equipment. Depending on demineralization economics, initial treatment by reverse osmosis may precede final treatment by ion exchange. Demineralized product water is stored in a condensate storage tank with a capacity of 200,000 gallons, which is sized for startup purposes.

Additional conditioning of the condensate and feedwater circulating in the steam cycle is provided by means of a chemical feed system. To minimize corrosion, an oxygen scavenger for dissolved oxygen control and an alkaline solution for pH control are fed into the condensate. To minimize scale formation in the HRSG evaporators and drums, a solution of disodium phosphate and trisodium phosphate is fed into each feedwater system. The chemical feed system includes an oxygen scavenger feed tank, an alkaline solution feed tank, and a phosphate solution feed tank

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for each feedwater system. Each of the feed tanks is provided with two full-capacity metering pumps.

A steam cycle sampling and analysis system monitors the water quality at various points in the plant's steam cycle. The water quality data is used to guide adjustments in water treatment processes and to determine the need for other corrective operational or maintenance measures. Steam and water samples are routed to a sample panel where steam samples are condensed and the pressure and temperature of all samples are reduced as necessary. The samples are then directed to automatic analyzers for continuous monitoring of conductivity and pH. All monitored values are indicated at the sample panel and critical values are transmitted to the plant control room. Grab samples are periodically obtained at the sample panel for chemical analyses that provide information on a range of water quality parameters.

CTG Evaporative Cooler Makeup

Water from the raw water storage tank is filtered prior to use as makeup for the CTG evaporative coolers. Alternatively, if reverse osmosis is included in the water treatment system, reverse osmosis product water may be used as makeup for the CTG evaporative coolers.

2.4.6.4 Cooling Systems

The power plant includes two cooling systems, the steam cycle heat rejection system and the closed cooling water system.

Steam Cycle Heat Rejection System

The cooling system for heat rejection from the steam cycle consists of a surface condenser, circulating water system, and a plume-abated wet cooling tower. The surface condenser receives exhaust steam from the LP section of the STG and condenses it to liquid for return to the HRSGs. The surface condenser is a shell-and-tube heat exchanger with wet, saturated steam condensing on the shell side and circulating water flowing through the tubes to provide cooling. The shell side of the condenser is designed to operate under a vacuum. For example, during base load operation at average ambient conditions, the condenser is expected to operate at an absolute pressure of 1.06 psia. Under these conditions, approximately 1,076,000 pounds per hour of wet, saturated steam is condensed, resulting in a heat rejection rate of approximately 1047 million Btu per hour. The closed cooling water system contributes another 50 million Btu per hour. This heat is absorbed by approximately 130,000 gallons per minute of circulating water, which warms the circulating water by approximately 17°F (20°F at peak load). The warmed circulating water exits the condenser and flows to the cooling tower.

The circulating water is distributed among multiple cells of the cooling tower, where it cascades downward through each cell and then collects in the cooling tower basin. The mechanical draft cooling tower employs electric motor-driven fans to move air through each cooling tower cell. The cascading circulating water is partially evaporated, and the evaporated water is dispersed to the atmosphere as part of the moist air leaving each cooling tower cell. The cooling tower's plume abatement design provides sufficient airflow to avoid the formation of a visible moisture

plume above the cooling tower cells. The circulating water is cooled primarily through its partial evaporation and secondarily through heat transfer with the air. The cooled circulating water is pumped from the cooling tower basin back to the surface condenser.

A small amount of water droplets is dispersed to the atmosphere along with the moist air leaving each cooling tower cell. These water droplets are referred to as “cooling tower drift” and are minimized by drift eliminators that are integral to the cooling tower design. Cooling tower drift is limited to 0.0005 percent of the circulating water flow. Because of the partial evaporation of the circulating water, dissolved solids in the circulating water are concentrated to approximately 3920 mg per liter, resulting in PM₁₀ drift emissions of approximately 0.65 pound per hour.

Closed Cooling Water System

The closed cooling water system is filled with a coolant such as a mixture of glycol and water. This coolant is pumped in a closed loop for the purpose of cooling equipment including the CTG and STG lubrication oil coolers, the CTG and STG generator coolers, air compressor after-coolers, steam cycle sample coolers, etc. The coolant picks up heat from the various equipment items being cooled, and the coolant itself is then cooled by non-contact heat exchange with a branch of the circulating water system.

2.4.7 Waste Management

This section describes the waste management processes whereby all wastes produced by the proposed project are properly collected, treated as necessary, and disposed of. Wastes include wastewater, non-hazardous solid waste, hazardous solid waste, and hazardous liquid waste.

2.4.7.1 Wastewater

The base load and peak load water balance diagrams presented in Figures 2.4-6 and 2.4-7 show the power plant’s wastewater streams and the disposition of wastewater. Wastewater is segregated into two separate collection systems. The first is the brine system, which collects wastewater from the HRSGs, CTG evaporative coolers, and demineralization system and delivers it to the circulating water system via the cooling tower basin. The second is the sanitary system, which collects wastewater from sanitary facilities such as sinks and toilets, combines it with effluent from the plant’s neutralization tank and general plant drainage, and delivers it to the City of Escondido’s sewer system.

Blowdown from the circulating water system will be returned to the City of Escondido’s HARRF via a new 1.1 mile, 8-inch return pipeline routed alongside the reclaimed water supply pipeline. The brine return pipeline will extend to a connection point with an existing City of Escondido brine return line. The route of the brine return pipeline is illustrated in Figure 2.2-1.

The base load and peak load water balance diagrams presented in Figures 2.4-6 and 2.4-7 provide estimated wastewater flow rates in gallons per minute and expected wastewater quality characteristics. Based on 8 hours of base load operation and 16 hours of peak load operation, the

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expected total quantity of brine (i.e., cooling tower blowdown) returned to the HARRF is 889,000 gallons per day. The quality of brine returned to the HARRF is presented in Table 2.4-4.

Table 2.4-4 – Quality of Brine Returned to the HARRF

Water Quality Parameter	Average Concentration at Base Load	Average Concentration at Peak Load	
Calcium	924	923	mg/l
Magnesium	476	475	mg/l
Sodium	1548	1547	mg/l
Potassium	93	92	mg/l
Total Alkalinity	150	150	mg/l
Sulfate	1867	1865	mg/l
Chloride	1314	1313	mg/l
Nitrate	8	8	mg/l
Carbon Dioxide	1	1	mg/l
Silica	20	20	mg/l
Total Dissolved Solids	3923	3920	mg/l

Concentrations stated in ppm as CaCO₃, except CO₂ and SiO₂ stated in ppm as such.

The following describes the plant's wastewater streams and treatments:

Circulating Water System Blowdown

Wastewater delivered to the cooling tower basin becomes part of the large volume of circulating water flowing through the basin.

The circulating water is partially evaporated in the cooling tower to approximately 4 cycles of concentration. The concentration of dissolved solids in the circulating water is maintained below given limits by withdrawing a portion of the circulating water (i.e., cooling tower blowdown) and replacing it with fresh makeup water from the raw water storage tank. Cooling tower blowdown is delivered to the City of Escondido's HARRF via the brine return pipeline.

HRSG Blowdown

Water circulating in the plant's steam cycle accumulates dissolved solids that must be maintained below given limits to prevent deposition of solid particles on the steam turbine blading of the STG. The concentration of dissolved solids is maintained below such limits by withdrawing a portion of the water from the HRSG steam drums (i.e., HRSG blowdown), and replacing it with product water from the demineralization process described previously. HRSG blowdown is delivered to the cooling tower basin.

CTG Evaporative Cooler Blowdown

Water circulating in the CTG evaporative coolers is partially evaporated, which concentrates the dissolved solids contained in the water. The concentration of dissolved solids is maintained below given limits by withdrawing a portion of the water (i.e., CTG evaporative cooler blowdown) and replacing it with the fresh makeup water described previously. CTG evaporative cooler blowdown is delivered to the cooling tower basin.

Demineralization System Wastewater

The ion exchange equipment used to demineralize HRSG makeup produces both acidic and alkaline wastewater streams during the equipment's periodic regeneration cycle. These streams are adjusted to neutral pH and then delivered to the cooling tower basin.

If reverse osmosis is included in the water treatment employed to produce HRSG makeup, the reverse osmosis equipment will continuously produce a concentrated reject water stream that contains all of the dissolved solids removed from the product water stream. Such reject water stream would be delivered to the cooling tower basin.

Chemical Feed Area Drainage

Chemical feed area drainage consists of spillage, tank overflows, maintenance operations, and area washdowns. Due to the potentially corrosive nature of this drainage, it is collected in corrosion-resistant piping separate from the general plant drainage system. The chemical feed area drainage is routed to a neutralization tank, adjusted to neutral pH, and then delivered to the sanitary wastewater system.

General Plant Drainage

General plant drainage consists of wastewater produced by sample drains, equipment drains, equipment leakage, and area washdowns. This wastewater is collected in a system of floor drains, sumps, and piping, and wastewater that potentially contains oil or grease is routed through an oil/water separator. General plant drainage is delivered to the sanitary wastewater system.

2.4.7.2 Non-Hazardous Solid Waste

The operation and maintenance of the plant generates non-hazardous solid wastes typical of power generation facilities. These wastes include scrap metal and plastic, insulation material, paper, glass, empty containers, and other miscellaneous solid wastes. These materials will be disposed of by means of contracted refuse collection and recycling services.

2.4.7.3 Hazardous Solid and Liquid Waste

The methods used to properly collect and dispose of any given hazardous solid or liquid waste generated by the plant depend on the nature of the waste. Hazardous solid and liquid wastes generated by the plant include spent SCR catalyst, spent lubrication oil filters, waste lubrication oil, and chemical cleaning wastes. Workers will be trained to handle waste generated at the site.

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Spent SCR catalyst will be recycled by the catalyst supplier or disposed of in a Class I landfill. Spent lubrication oil filters will be disposed of in a Class I landfill. Waste lubrication oil will be recovered and recycled by a waste oil recycling contractor.

Chemical cleaning wastes consist of acid and alkaline cleaning solutions used for pre-operational chemical cleaning of the HRSG pressure parts and steam cycle piping systems, acid cleaning solutions used for periodic chemical cleaning of the HRSGs, and wash water used in periodic cleaning of the HRSG fire side and STG. These wastes, which typically have high concentrations of metals, will be stored temporarily on-site in portable tanks and disposed of off-site by chemical cleaning contractors. These and all other hazardous solid and liquid wastes will be disposed of in accordance with applicable laws, ordinances, regulations, and standards.

2.4.8 Hazardous Materials Management

There will be a variety of hazardous materials used and stored during construction and operation of the proposed project. All hazardous materials will be stored in appropriate storage facilities. Bulk materials will be stored in tanks, and other materials will be stored in delivery containers. All hazardous material storage and use areas will be designed to contain leaks and spills. Containment structures will be sized to contain the spill of a full tank without overflow. For multiple tanks located within a single containment structure, the largest single tank will be used to size the containment structure.

Aqueous ammonia for the SCR system will be less than 20% ammonia, and the balance water. The aqueous ammonia storage tank will be provided with a containment basin draining to a covered collection sump. The collection sump will be sized to contain the entire contents of the aqueous ammonia storage tank.

Safety showers and eyewashes will be provided in the chemical feed areas. Service water hose connections will be provided near the chemical feed areas to facilitate flushing of leaks and spills to the chemical feed area drains. Appropriate safety gear will be provided for plant personnel for use during the handling, use, and cleanup of hazardous materials. Plant personnel will be properly trained in the handling, use, and cleanup of hazardous materials used at the plant and in procedures to be followed in the event of a leak or spill. Adequate supplies of appropriate cleanup materials will be stored on-site.

All electric equipment will be specified to be free of polychlorinated biphenyls (PCBs).

A list of the hazardous materials anticipated for use at the plant is provided in Table 2.4-5. The intended use and estimated quantity to be stored on-site is identified for each material.

Table 2.4-5 – Hazardous Materials Usage and Storage

Material	Use	Quantity Stored On-site
Aqueous Ammonia	NO _x emissions control	20,000 gallons (14 days storage)
Organic Phosphate Inhibitor Solution	Circulating water scale control	4,000 gallons (30 days storage)
Sodium Hypochlorite Solution	Circulating water biofouling control	2,500 gallons (30 days storage)
Sulfuric Acid	Circulating water pH reduction and demineralizer regeneration	7,500 gallons (30 days storage)
Sodium Hydroxide	Demineralizer regeneration	7,500 gallons (30 days storage)
Oxygen Scavenger Solution	Condensate oxygen control	250 gallons (30 days storage)
Alkaline Solution (e.g., Amine)	Condensate pH control	250 gallons (30 days storage)
Disodium and Trisodium Phosphate Solution	Boiler water scale control	1000 gallons (30 days storage)
Hydrochloric Acid	HRSG chemical cleaning	Temporary
Ammonium Bifluoride	HRSG chemical cleaning	Temporary
Citric Acid	HRSG chemical cleaning	Temporary
EDTA Chelant	HRSG chemical cleaning	Temporary
Sodium Nitrite	HRSG chemical cleaning	Temporary
Sulfuric Acid	Station batteries	3,000 gallons
Hydrogen	Generator cooling	60,000 scf (trailer mounted tanks)

2.4.9 Air Emissions Control and Monitoring

Air emissions from the combustion of natural gas in the CTGs and duct burners are controlled by state-of-the-art systems. Emissions that are controlled include nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), fine particulate matter (PM₁₀), and sulfur dioxide (SO₂). Continuous emissions monitoring is performed to ensure that the control systems perform correctly and to provide compliance documentation. All emissions values stated in the following subsections are based on parts per million by volume, dry basis (ppmvd) corrected to 15% oxygen (O₂).

2.4.9.1 NO_x Emissions Control

Dry low NO_x (DLN) combustors in the CTGs followed by selective catalytic reduction (SCR) in the HRSGs controls stack emissions of NO_x to a maximum 2.0 ppmvd (3-hour average, excluding startups). The DLN combustors control NO_x emissions to approximately 9 ppmvd at the CTG exhausts by pre-mixing fuel and air immediately prior to combustion. Pre-mixing inhibits NO_x formation by minimizing both the flame temperature and the concentration of oxygen at the flame front.

The SCR process uses aqueous ammonia (NH₄OH) as a reagent. Stack emissions of ammonia, referred to as “ammonia slip”, are up to 10 ppmvd. The SCR system includes a catalyst bed

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located within each HRSG, ammonia storage system, and ammonia injection system. The catalyst bed is located in a temperature zone of the HRSG where the catalyst is most effective over the range of loads at which the plant will operate. The ammonia injection grid is located upstream of the catalyst bed. The maximum ammonia injection rate is approximately 27 gallons per hour per HRSG. A 20,000 gallon aqueous ammonia storage tank located on the power plant site provides sufficient capacity for 14 days of continuous, base load operation.

2.4.9.2 CO and VOC Emissions Control

An oxidation catalyst located within each HRSG controls stack emissions of CO to a maximum 4.0 ppmvd (3-hour average, excluding startups). The oxidation catalyst also reduces stack emissions of VOC up to a maximum 3.0 ppmvd (excluding startups).

2.4.9.3 PM₁₀ and SO₂ Emissions Control

PM₁₀ emissions are controlled by inlet air filtration and by the use of natural gas fuel, which contains essentially zero particulate matter. Stack emissions of PM₁₀ consist primarily of hydrocarbon particles formed during combustion and may be up to a maximum 14.0 pounds per hour per CTG. SO₂ emissions are controlled by the use of natural gas fuel, which contains only trace quantities of sulfur.

2.4.9.4 Emissions Monitoring

The continuous emissions monitoring system (CEMS) samples, analyzes, and records NO_x, CO, and O₂ concentrations in the stack exhaust. The CEMS generates a log of emissions data for compliance documentation and activates an alarm in the plant control room when stack emissions exceed specified limits.

2.4.10 Fire Protection

Fire protection systems are provided to limit personnel injury, property loss, and plant downtime resulting from a fire. The systems include a fire protection water system, carbon dioxide fire suppression systems for the CTGs, and portable fire extinguishers.

The fire protection water system is supplied from a dedicated 200,000 gallon portion of the 730,000 gallon raw water storage tank located at the power plant. Two electric motor-driven fire pumps, each with a capacity of 500 gallons per minute, deliver water to the fire protection water piping network. A third electric motor-driven pump, a small capacity jockey pump, maintains pressure in the piping network. If the jockey pump is unable to maintain a set operating pressure in the piping network, one of the fire pumps starts automatically. If the first fire pump is unable to maintain a set operating pressure, the second fire pump starts automatically. If the second fire pump is unable to maintain a set operating pressure, or if both fire pumps fail to start, the piping network receives water and pressure from a connection with Rincon del Diablo Municipal Water District. The piping network is configured in a loop so that a piping failure can be isolated with shutoff valves without interrupting the supply of water to a majority of the loop. The piping network supplies fire hydrants located at intervals throughout the power plant site, and it also supplies a sprinkler system in the operations building.

The carbon dioxide (CO₂) fire suppression system provided for each CTG includes a CO₂ storage tank, CO₂ piping and nozzles, fire detection sensors, and a control system. The control system automatically shuts down the CTG, turns off ventilation fans, closes ventilation openings, and releases CO₂ upon detection and automated confirmation of the existence of a fire. The CO₂ fire suppression systems cover the turbine and accessory equipment enclosures of each CTG.

Portable fire extinguishers of appropriate sizes and types are located throughout the plant site.

2.4.11 Plant Auxiliary Systems

The following plant auxiliary systems control, protect, and support the power plant and its operation.

2.4.11.1 Distributed Control System

The Distributed Control System (DCS) provides control, monitoring, alarm, and data storage functions for power plant systems.

The following functions are provided:

- Control of the CTGs, STG, HRSGs, and balance-of-plant systems in a coordinated manner.
- Monitoring of operating parameters from plant systems and equipment, and visual display of the associated operating data to control operators and technicians.
- Detection of abnormal operating parameters and parameter trends, and provision of visual and audible alarms to apprise control operators of such conditions.
- Storage and retrieval of historical operating data.

The DCS is a microprocessor-based system. Redundant capability is provided for critical DCS components such that no single component failure will cause a plant outage. The DCS consists of the following major components:

- CRT-based control operator interface (redundant).
- CRT-based control technician work station.
- Multi-function processors (redundant).
- Input/output processors (redundant for critical control parameters).
- Field sensors and distributed processors (redundant for critical control parameters).
- Historical data archive.
- Printers, data highways, data links, control cabling, and cable trays.

The DCS is linked to the control systems furnished by the CTG and STG suppliers. These data links provide CTG and STG control, monitoring, alarm, and data storage functions via the CRT-based control operator interface and control technician work station of the DCS.

2.4.11.2 Lighting System

The lighting system provides operations and maintenance personnel with illumination in both normal and emergency conditions. The system consists primarily of AC lighting, and includes DC lighting for activities or emergency egress required during an outage of the plant's AC electrical system. The lighting system also provides AC convenience outlets for portable lamps and tools.

2.4.11.3 Grounding System

The power plant's electrical systems and equipment are susceptible to ground faults, switching surges, and lightning that can impose hazardous voltage and current on plant equipment and structures. To protect against personnel injury and equipment damage, the grounding system provides an adequate path to ground for dissipation of hazardous voltage and current.

The grounding system is provided with adequate capacity to dissipate hazardous voltage and current under the most severe conditions. Bare conductor is installed below grade in a grid pattern, and each junction of the grid is bonded together by welding or mechanical clamps. The grid spacing is designed to maintain safe voltage gradients. Ground resistivity readings are used to determine the necessary grid spacing and numbers of ground rods. Steel structures and non-energized parts of plant electrical equipment are connected to the grounding grid.

2.4.11.4 Cathodic Protection System

The cathodic protection system protects against electrochemical corrosion of underground metal piping and structures.

2.4.11.5 Freeze Protection Systems

Due to the infrequency and short duration of below-freezing ambient temperatures at the project site, freeze protection systems are not necessary.

2.4.11.6 Service Air System

The service air system supplies compressed air to hose connections located at intervals throughout the power plant. Compressors deliver compressed air at a regulated pressure to the service air piping network.

2.4.11.7 Instrument Air System

The instrument air system provides dry, filtered air to pneumatic operators and devices throughout the power plant. Air from the service air system is dried, filtered, and pressure regulated prior to delivery to the instrument air piping network.

2.5 POWER PLANT CIVIL/STRUCTURAL FEATURES

The following sections describe civil/structural features of the power plant, as illustrated in the project site arrangement presented in Figure 2.4-1. Figure 2.5-1 illustrates the project site's currently existing topography, and Figure 2.5-2 illustrates the topography that will exist after grading of the industrial park described in Sections 2.2 and 2.3. The power plant will be designed in conformance with Uniform Building Code criteria for Seismic Zone 4.

2.5.1 CTGs, HRSGs, STG, and Associated Equipment

The CTGs, HRSGs, STG, and condenser are located outdoors and are supported on reinforced concrete mat foundations. The STG foundation includes a reinforced concrete pedestal that supports the STG above the surface condenser. The three step-up transformers and two auxiliary transformers are also supported on reinforced concrete mat foundations. Balance-of-plant mechanical and electrical equipment are supported on individual reinforced concrete pads.

2.5.2 Stacks

Each HRSG is provided with a self-supporting steel stack. The stacks are 17 feet in diameter and 110 feet tall. The stacks include sampling ports, ladders, platforms, and electrical grounding.

2.5.3 Buildings

The operations building incorporates control, maintenance, and administrative functions. The design and construction of the operations building will be consistent with development standards established for the industrial park described in Sections 2.2 and 2.3. Other buildings consist of pre-engineered enclosures for balance-of-plant mechanical and electrical equipment. Building columns are supported on reinforced concrete mat foundations or individual spread footings, and ground floors consist of reinforced concrete slabs.

2.5.4 Water Storage Tanks

Water storage tanks include a raw water storage tank with a capacity of 730,000 gallons and a condensate storage tank with a capacity of 200,000 gallons. Each water storage tank is a vertical, cylindrical, field-erected steel tank supported on a suitable foundation consisting of either a reinforced concrete mat or a reinforced concrete ring wall with an interior bearing layer of compacted sand supporting the tank bottom.

2.5.5 Roads and Fencing

Primary access to the site is provided by a new 30 foot wide, 200 foot long paved road extending across the SDG&E transmission corridor from the future Citracado Parkway to the south end of the site. Secondary access to the site is provided by a new 20 foot wide, 200 foot long paved road extending across the SDG&E transmission corridor from the future Citracado Parkway to the north end of the site. The site access roads are illustrated in Figure 2.2-2. A 20 foot wide, paved loop road provides access to the power plant facilities, as illustrated in Figure 2.4-1.

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Paving also includes a parking lot and roads encircling the turbine-generator and HRSG areas. The remaining plant areas are gravel surfaced.

The project site is secured with aesthetic steel fencing or screen walls, selected as appropriate for specific visual settings along the site perimeter. Within the project site, chain link security fencing is provided around the switchyard. Controlled access gates are located at the entrances to the project site.

2.5.6 Sanitary Wastewater System

The sanitary wastewater system collects wastewater from sanitary facilities such as sinks and toilets, combines it with effluent from the plant's neutralization tank and general plant drainage, and delivers it to the City of Escondido's sewer system.

2.5.7 Site Drainage

For site drainage purposes, the small areas that have potential for causing oil contamination of storm water are segregated from the balance of the site by means of curbs, sloped pavement, etc. The resulting low volume of storm water with potential for oil contamination is collected in the general plant drainage system, routed through an oil/water separator, and delivered to the sanitary wastewater system. Storm water from all other areas of the site will flow along a surface drainage system providing gravity flow away from the power plant and toward collection points for delivery to the industrial park's and/or City of Escondido's storm water system.

2.5.8 Earthwork

Existing site elevations range from approximately 740 to 826 feet amsl, and a large majority of the site lies between 750 and 790 feet amsl, as illustrated in Figure 2.5-1. Mass grading of the 186-acre industrial park will result in a graded pad comprising each Planning Area, including the 14.1-acre Planning Area 1 proposed for use as the power plant site, as illustrated in Figure 2.2-2. In creating the pad for Planning Area 1, approximately 735,000 cubic yards of material will be cut and 2,000 cubic yards filled, resulting in an elevation of approximately 750 feet amsl. The net excavated materials from Planning Area 1 will be used as fill in other portions of the industrial park. Cut and fill slopes in Planning Area 1 are expected to have pitches of 1.5:1 and 2.0:1, respectively (horizontal to vertical). The grading of Planning Area 1 will be completed as part of the grading for the overall industrial park, and prior to initiation of any work on the proposed project. The project site topography that will exist after grading of the industrial park is illustrated in Figure 2.5-2. Earthwork associated with the proposed project will consist of excavation for foundations and underground systems.

Figure 2.5-1 Existing Site Topography

Figure 2.5-2 Site Topography after Grading of the Industrial Park

2.6 TRANSMISSION LINE DESCRIPTION

The plant switchyard is directly connected with the SDG&E transmission system via a loop-in of the existing 230 kV Escondido-Sycamore Canyon transmission line which runs along the western boundary of the project site. The project does not require the construction of any new transmission lines. A system impact study prepared by SDG&E for the project is provided as Appendix B.

2.6.1 Transmission Line Improvements for Visual Aesthetics

In order to improve the visual aesthetics of the existing 230 kV and 138 kV transmission lines running through the planned industrial park and along the western boundary of the project site, six lattice towers will be replaced with tubular steel poles, and one lattice tower will be eliminated. As an additional measure to improve visual aesthetics, 69 kV transmission lines running through the planned industrial park will be rebuilt and/or undergrounded. These improvements are for benefit of the planned industrial park and are not necessary for interconnection of the proposed power plant. The improvements will be constructed by SDG&E, as these transmission lines form part of the SDG&E transmission network.

2.7 PIPELINE FACILITIES DESCRIPTION

The following sections describe the project's pipeline facilities and routes.

2.7.1 Natural Gas System Upgrade by SDG&E

The project will be fueled with natural gas delivered via the SDG&E gas system. An existing 16-inch SDG&E natural gas pipeline with sufficient capacity to serve the project is located immediately adjacent to the northeast corner of the project site at the end of Enterprise Street. In order to relieve a bottleneck in a segment of the existing SDG&E gas system located about 1 mile northeast of the project site, SDG&E will construct an upgrade consisting of approximately 2600 feet of 16-inch pipeline. This SDG&E upgrade will be routed along Lincoln Avenue from its intersection with Rock Springs Road to its intersection with Metcalf Street, and then along Metcalf Street to its intersection with Mission Avenue. The location of the SDG&E gas system upgrade is illustrated in Figure 2.2-1.

2.7.2 Reclaimed Water Supply Pipeline

Reclaimed water for the project will be supplied from the City of Escondido's Hale Avenue Resource Recovery Facility (HARRF). The reclaimed water will be conveyed via a new 1.1 mile, 16-inch supply pipeline extending from a connection point with an existing City of Escondido reclaimed water main. The connection point is located on Harmony Grove Road immediately northwest of the road's crossing over Escondido Creek. From this connection point, the pipeline route extends northwest along Harmony Grove Road to its intersection with Enterprise Street, southwest and then west along Harmony Grove Road to the north-south portion of the SDG&E transmission corridor that crosses through the planned industrial park, and north either along the SDG&E transmission corridor or Citracado Parkway to the power plant. The route of the reclaimed water supply pipeline is illustrated in Figure 2.2-1.

The reclaimed water supply pipeline will be of color-coded PVC material. The pipeline will be underground for its entire length and will be provided with a minimum of 36 inches of cover. The portion of the pipeline route that runs along Harmony Grove Road is level and paved with asphalt. This portion of the pipeline will either be constructed by the City of Escondido or will require an encroachment permit from the City. The remaining portion of the pipeline route crosses through the planned industrial park over hilly terrain that will be fully disturbed by mass grading for the industrial park.

2.7.3 Brine Return Pipeline

Brine from the project will be returned to the City of Escondido's HARRF via a new 1.1 mile, 8-inch return pipeline routed alongside the reclaimed water supply pipeline. The brine return pipeline will extend to a connection point with an existing City of Escondido brine return line. The design of the brine return pipeline will be similar to the reclaimed water supply pipeline.

2.8 PROJECT CONSTRUCTION

On-site construction of the project is expected to begin in the fourth quarter of 2002, following completion of mass grading for the planned industrial park. Construction is expected to continue for 21 months, with completion planned for the summer of 2004. There will be an average and peak on-site construction workforce of approximately 240 and 350 individuals, respectively. The on-site workforce will consist of laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel. The on-site workforce is expected to reach its peak during the eleventh month of construction.

Temporary construction laydown and parking areas will be provided south of the power plant site in Planning Area 2 of the industrial park, as illustrated in Figure 2.2-2. Construction access will be provided from State Highway 78 by traveling south on Nordahl Road, which becomes Vineyard Avenue, continuing southeast on Vineyard Avenue to the future Citracado Parkway, and south on Citracado Parkway to the project site. Equipment and materials will be delivered by truck. Construction will typically take place between the hours of 6 a.m. and 5:30 p.m., Monday through Friday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. During the startup and testing phase of the project, some activities may continue 24 hours per day, 7 days per week.

Estimates of the average and peak construction traffic during the on-site construction period are provided in Table 2.8-1.

Table 2.8-1 – Average and Peak Construction Traffic

Vehicle Type	Average Daily Round Trips	Peak Daily Round Trips
Construction Worker Vehicles ¹	240	350
Delivery Vehicles including Heavy Trucks	12	30
TOTAL	252	380

¹ Assumes that none of the workforce will carpool.

2.9 FACILITY OPERATION

The power plant will be controlled and operated by two or three individuals during each operating shift. Additional maintenance and supervisory personnel will be present during the day shift and, as required by specific operations or maintenance activities, during evening and night shifts. The project will employ about 20 full-time personnel. The power plant will be operated up to 7 days per week, 24 hours per day. When the plant is not operating, personnel will be present as necessary for maintenance and to prepare the plant for startup. During extended outages when no operations or maintenance activities are in progress, at least one individual will be on-site during all hours for security purposes.

Overall annual availability of the power plant is expected to be in the range of 92 to 96 percent. The plant's capacity factor will depend on the provisions of bilateral power sales contracts as well as market prices for electricity, ancillary services, and natural gas. The design of the power plant provides for operating flexibility (i.e., ability to start up, shut down, turn down, and provide peaking output) so that operations may be readily adapted to changing market conditions.

Operation of the power plant will reflect the provisions of bilateral power sales contracts as well as volatility in the energy marketplace. When electricity prices are higher than the incremental cost of power produced by the plant, output from the plant will tend to be increased. When electricity prices are lower than the decremental cost of power produced by the plant, output from the plant will tend to be decreased or curtailed. If prices are expected to remain below the cost of production for a period of several hours, one CTG may be shut down and later restarted when prices have rebounded sufficiently. If prices are expected to remain below the cost of production for an extended period of time, both CTGs and the STG may be shut down and later restarted when prices have rebounded sufficiently.

The Palomar Energy Project is among those resources that have been identified as potential suppliers of electricity under a contract between Sempra Energy Resources and the California Department of Water Resources for the sale of 1900 MW. The City of Escondido has also expressed interest in purchasing electricity from the project. Electricity produced by the plant will be sold in accordance with such bilateral arrangements and other wholesale market transactions. To the extent bilateral power sales are based on stable pricing or necessitate a specific mode of plant operation, the plant will be less reactive to volatility in the energy marketplace. Depending on market conditions and the provisions of bilateral sales, in any given hour the plant may be operating at peak load, base load, part load with both CTGs, part load with one CTG, or the plant may be entirely shut down. Peak load operation will tend to occur during summer on-peak hours, base load operation during summer off-peak hours and non-summer on-peak hours, minimum load operation during non-summer off-peak hours, and shut down periods during non-summer weekends. Shut down periods for annual maintenance will be scheduled during extended periods of low prices, which typically occur in the winter or spring.

Ancillary services provided by the plant will be sold to the California Independent System Operator and possibly to other market participants. These services include regulation, operating reserves to the extent the plant is not operating at full load, and reactive power production.

2.10 FACILITY CLOSURE

Facility closure can be temporary or permanent. Temporary closure consists of a cessation in operations for a period of time greater than the time required for routine maintenance, overhauls, or replacements of major equipment. Typical causes for temporary closure include short-term economic considerations or damage to the facility resulting from events such as earthquake or fire. Permanent closure consists of a cessation in operations with no intent to restart operations. The typical cause for permanent closure is a combination of facility age and long-term economic considerations. Both temporary and permanent closures are addressed in the following sections.

2.10.1 Temporary Closure

In the event of a temporary closure, 24-hour security for the facility will be maintained and the California Energy Commission (CEC) will be notified. Actions taken will depend on whether the temporary closure involves a release of hazardous materials.

If there is no release or threatened release of hazardous materials, a contingency plan for the temporary cessation of operations will be implemented. The contingency plan will be conducted to assure public health and safety, protection of the environment, and conformance with all applicable laws, ordinances, regulations, and standards. Appropriate procedures will depend on the anticipated duration of the shutdown. Accordingly, the contingency plan may include the draining and proper disposal of chemicals, water, and other fluids from storage tanks and plant equipment, as well as various other procedures to ensure worker safety and to protect plant equipment and the environment.

If there is a release or threatened release of hazardous materials, procedures set forth in a Risk Management Plan will be implemented. Such procedures include measures to control the release of hazardous materials, notification of appropriate authorities and the public, training for plant personnel, and other emergency response actions and preparation. Once the release of hazardous materials has been contained and cleaned up, temporary closure will proceed as in the case of a closure where there is no release of hazardous materials.

2.10.2 Permanent Closure

The planned operational life of the facility is 30 years. However, if the facility continues to be economically viable, it could be operated for a longer period of time, and operation beyond 30 years would defer environmental impacts resulting from the construction of replacement facilities. It is also possible that the facility could become economically non-competitive before 30 years have transpired, resulting in early decommissioning. Whether the facility is closed at the expiration of 30 years, after more than 30 years, or prior to 30 years due to economic

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considerations or other reasons, procedures set forth in a decommissioning plan will be implemented. The decommissioning plan to be prepared is described below.

To assure public health and safety, protection of the environment, and conformance with applicable laws, ordinances, regulations, and standards, the decommissioning plan will be submitted to the CEC for review prior to commencement of permanent closure measures. Such measures may range from extensive “mothballing” to removal of all equipment and appurtenances, depending on circumstances at the time. Because future conditions that would affect decommissioning decisions are largely unknown at this time, decommissioning details will be developed and submitted to the CEC and other jurisdictional agencies when more information is available and the time for permanent closure has drawn closer.

The decommissioning plan will include the following:

- Description of the proposed decommissioning measures for the facility and for all appurtenances constructed as part of the facility.
- Description of the activities necessary to restore the site if circumstances call for removal of all equipment and appurtenances.
- Discussion of decommissioning alternatives other than restoration of the site.
- Presentation of the costs associated with the proposed decommissioning measures and the source of funds to pay for the decommissioning.
- Discussion of conformance with applicable laws, ordinances, regulations, and standards and with local and regional plans.

In general, the proposed decommissioning measures will attempt to maximize the recycling of all facility components. Unused chemicals will be sold back to the suppliers or other purchasers. All equipment will be shut down and drained so as assure public health and safety and protection of the environment, and all hazardous and non-hazardous waste materials will be collected and disposed of properly. Until decommissioning activities have been completed, 24-hour security for the facility will be maintained.